Teacher Background Information
Plant Tour (SC070113)

The analogy of a plant to a factory is not a superficial one. In agronomy, inputs and outputs are measured in much the same way as economists might measure factory efficiency. Estuaries and the most efficient land crops bind between 500 and 1250 grams of carbon per square meter per year into organic molecules. The open-ocean and grasslands bind between 40 and 80 grams of carbon per square meter per year.

Advanced students may wish to investigate comparative rates of photosynthesis in greater depth. Land plants show two distinctly different photosynthetic paths. Most plants plod with so-called C_3 photosynthesis. But some aggressive producers use a specialized two-step pathway called C_4. Corn, crabgrass, and sugarcane thrive in hot, dry environments using this path. These pathways exist in the ocean, as well. To explore them with your students, go to the following website.

Photosynthesis. Ed. Ilana Berman Frank. Institute of Marine and Coastal Sciences, Rutgers University. 4 February 2002 <www.woodrow.org/teachers/esi/1999/princeton/progress/C3_C4.html>.

The organization of group work in middle schools requires subtle intervention and coaching by the teacher. Move through the room to ensure that groups do not select the most vocal male as the Plant Manager. (You may find that drawing lots for the lead role works in your classroom.) Make sure that each student has a role playing card and that each group knows what it must accomplish. Half way through the period, move through the room again and then ask students what they have accomplished. It is also essential to monitor and guide student dialogue. This lesson should reinforce the connection between structure and function. Encourage that objective with statements like:

- "The leaf is flat because that shape helps it do the job of…"
- "There are stiff tubes in a plant's stem because the stem must do the job of…"
- "The leaf is full of open, spongy areas because each cell must…"

Also encourage students to go back over their notes to find information for their presentation. "We know that the plant uses carbon dioxide because…"

Throughout the presentation, emphasize the "mission" of this plant.

If you use this presentation as an assessment, develop your own rubric from the suggestions in the exercise. Keep in mind that the benchmarks emphasize energy, transport, and evidence. Those three concepts are more important than more detailed terms.

Here is one possible rubric:

0 Students create dialogue that does not reflect knowledge or understanding of the structure of a plant.

1 Students create dialogue which has knowledge of terms which are used in plant anatomy, but do not relate organs to one another or to function.

2 Students use anatomy terms in dialogue and relate organs to one another, but do not relate structure to function.

3 Students use anatomy terms in dialogue and relate organs to one another, and use at least one statement relating structure to function.

4 Students consistently use anatomy terms, relate organs to one another, and relate structure to function in their dialogue.